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Transportation Research TRANSEARCH

A RESEARCH AND DEVELOPMENT TECHNICAL PUBLICATION

TECHNOLOGY TRANSFER – ON THE LEADING EDGE

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Director's Comments

A DECADE PAST AND FUTURE

January 1, 1990 heralded a new decade. The old decade was somehow special to me, the first time in my working life that I had spent a whole one with the same organization. I paused to reflect on the technological changes that had taken place at Alberta Transportation and Utilities over that decade and then mused on where transportation research might take us by the start of the new millennium.

We have come a long way technologically in ten years. Many of you can remember what it was like prior to 1980, but many also can't, so let's reflect on the technological advances of the 80's in the department!

Probably the most significant achievement has been the use of automation, in particular the use of computer hardware and software to assist our clerical, technical and professional staff to improve efficiency and effectiveness across the department. More specifically, the following leap to mind:

- The Intergraph System wasn't there - all drafting was done by hand. Look at it now, it's everywhere in the department - hard to imagine how we did all those plans and designs without it!
- Could you believe we didn't have microcomputers on

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About This Publication

The **TRANSEARCH** quarterly publication is prepared by the Research and Development Branch of Alberta Transportation and Utilities. The publication is dedicated to the effective transfer of transportation and utilities related research information and state-of-the-art technologies throughout the department.

In short news and feature articles, **TRANSEARCH** reports on the most interesting research and technologically significant events concerning the department.

In the interest of providing a vehicle for the effective transfer of technology throughout the department, Research and Development encourages department staff to provide proposals containing unique ideas, innovations or opportunities for research and evaluation which may provide solutions to the various technical needs of the department.

This publication is distributed throughout the department of Alberta Transportation and Utilities. Back issues will be catalogued and retained in the department library. Copies of **TRANSEARCH** are also distributed to other Canadian D.O.T.s as well as Alberta Cities.

Comments and suggestions may be submitted to:

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CANADIANA
APR 18 1990

our desks, just terminals linked to the mainframes at the Terrace Building - now the power of those mainframes is on our desks! Typing also was a nightmare - correcting typos with whiteout, cutting and pasting paragraphs, how archaic!

- There was no recycling of asphalt pavements - we'd heard that this novel approach had been tried, but we certainly hadn't done it here. Look at the savings we are now realising with our pavement recycling activities.
- Whoever had heard of colour copiers? We first saw them in 1981 at $2.00 for an 8"x11" copy. Now we rent our own machine in the copying room and it's very affordable.
- Do you remember those mechanical and tape traffic counters that were Al Werner's pride and joy? Look what we have now, electronic counters, classifiers, (solar powered no less in certain locations) and all communicating with a personal computer in the office!
- Static weigh scales - well we had those at each of the vehicle inspection stations. But weigh in motion scales, like those on Highway 2 at Leduc, hadn't been heard of! Even that is old technology now, instead of massive plates and pits in the pavement, we are on the verge of developing piezo weight in motion, with just a cable across the travel lane!
- What about surveying? We had Electronic Distance Measuring but who had ever heard of laser survey systems - where will we go next?
- How did we collect field data? Meticulously and arduously by hand. Now we have data loggers that conveniently measure and record the data for us at preset intervals for collection at our convenience.
- How did we look at what was on or around the highway? Well we drove out and had a look of course - many miles at times for a 10 minute look, but it was necessary. Then came rapid advances in video technology and now we routinely stroll round to one of our video monitors and take a look at the video tapes that are taken by the videolog van - sure beats going out at -40 degrees Celsius!
- And how did we collect our pavement distress information - painfully and slowly - wedges and straight edges for rutting; measuring and hand drawing for cracking. Now we have the ARAN and its workstation. We look at the pavement from video and the roughness, rutting and cracking information is generated in the office from surveys carried out by the ARAN at highway speeds!

There were many other things we didn't have - automated monitoring at the Transportation Lab; map information and retrieval systems; automated frost probes; cellular telephones and of course the Research and Development Branch! We have come a long way technologically in the last decade.

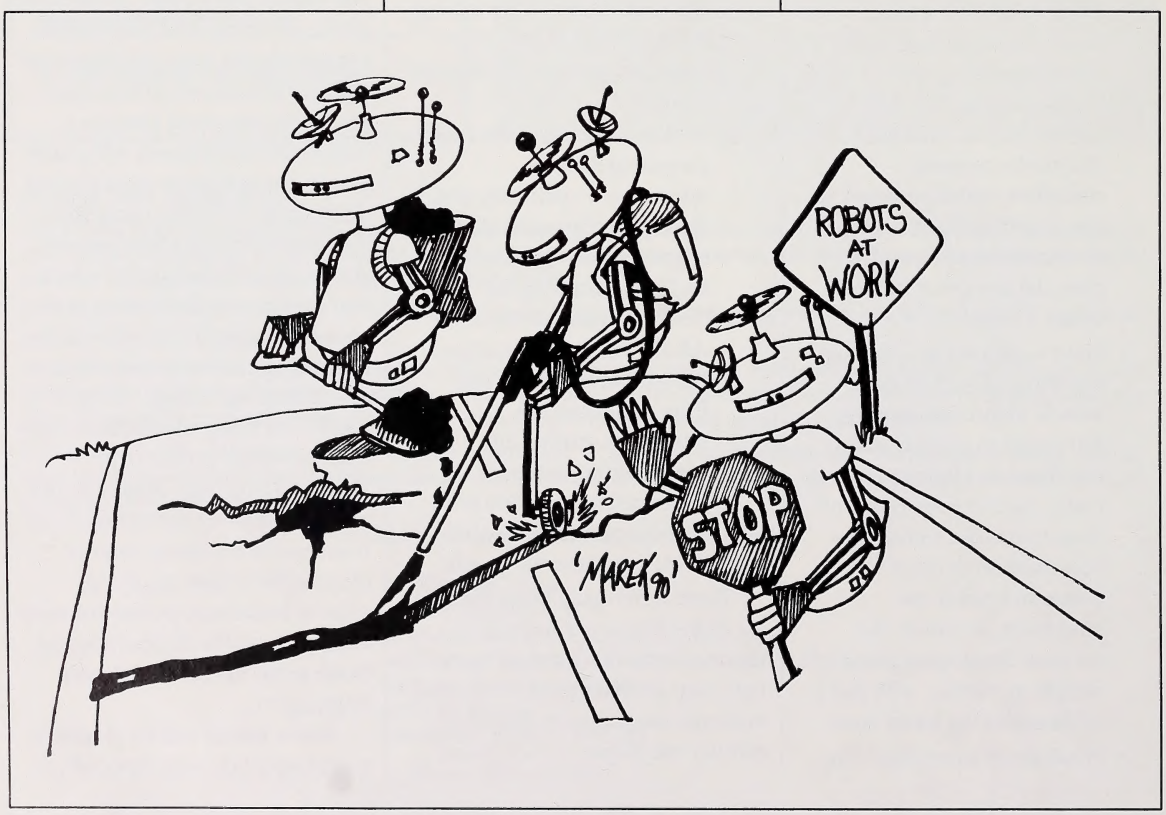
And what of the future? Where will current and future transportation related research take us by the end of the millennium? Would we recognize the world we will be living in, in the year 2000? Ever heard of "gridlock"? It's hard to visualize in Alberta with its wide open spaces, even in Edmonton and Calgary. Not so in large American and European cities however! Take Los Angeles for example, every day freeway after freeway is jammed solid with traffic moving nowhere! That is "gridlock" and it certainly is not limited to Los Angeles, most major cities of the world suffer from it to a lesser or greater degree. A maze of technologies to resolve this problem is just around the corner! In car route guidance, using satellite positioning techniques, precision digitized city and country street and road maps and advanced telecommunication techniques, will guide you by the optimum route to your destination, avoiding congestion spots, accidents or other hazards. Automated highways will whisk you over hundreds of miles at the speed limit, while you relax in the comfort of your very fuel efficient car. Not so far fetched - even now research is being conducted to provide automatic guidance of vehicles along high density routes while adequately separating them from each other using radar or other technologies, applying vehicle brakes and power automatically to keep the desired spacing (refer to the next article *"Smart Highways"*).

Public transit will be playing a more important role, especially in

affected by emerging technologies. Again using satellite positioning and communication techniques trucking companies will be able to visually track their vehicles on computer screens, know where each one is in real time, and vastly improve the efficiency of their operations. Imagine strategically placed one stop vehicle inspection stations, where totally automated operations check your rolling vehicle for compliance with weight requirements; using your vehicles special identification the system checks your permits, the validity of your driving license, updates you on the weather conditions ahead and warns you of any hazards on your designated route - all in the time it takes you to roll through that vehicle inspection station - quite a convenience.

Construction and design of roads is going to benefit from satellite positioning technology by improved surveying techniques. Imagine not having to have line of sight between two adjacent points to be able to obtain their three dimensional coordinates to first order or better surveying accuracy! Think of the clearing of bush that won't have to be done to survey potential highway routes - the time it will save! Surveying using the Global Positioning System satellites is in its infancy now, but by the turn of this decade it will be routine. Surveys will be done quickly and efficiently saving millions of dollars annually. "As built plans" of roadways and the inventory on them will be surveyed using vehicles travelling at highway speeds and recording all the information in 3-D coordinates in real time.

Maintenance of roads - nothing high tech there! Wrong again! Even now research is being conducted into better snow plows that will throw the snow further and require less power; ice bond prevention and destruction on highways are hot topics of research. How about crackfilling and pot hole repairs? Robots are being developed to "see" the cracks and holes using video cameras and pattern recognition techniques and then the robots will route and clean the hole and crackfill it automatically with the appropriate repair material. What a safety bonus, not having to expose maintenance personnel to the hazards of high speed traffic. And those flagpersons that you see on our roads



holes using video cameras and pattern recognition techniques and then the robots will route and clean the hole and crackfill it automatically with the appropriate repair material. What a safety bonus, not having to expose maintenance personnel to the hazards of high speed traffic. And those flagpersons that you see on our roads all the time, will be replaced by little R2D2's or something similar.

What about computers - well I can't even speculate where we will be in 2000 A.D., but one thing is for sure, we'll be heavily reliant on them and artificial intelligence in some form will be commonplace. Many of us might see tasks that we used to do being done by robots, and expert systems that solve problems requiring human knowledge or intuition, will be a big tool of the future.

And what of the environment what with the problems in the ozone layer, the greenhouse effect, what will happen to our vehicles. Without doubt the internal combustion engine will be under attack. Carbon dioxide and nitrogen oxides must be cut back! Much more fuel efficient vehicles will be on the road, the internal combustion engine will not yet be extinct, but emissions will be much lower; alternate fuels will be in use as will electric cars and vehicles assisted by solar energy.

The crystal ball is growing dim..... I think I'll keep a copy of this article and read it again on January 1, 2000 and see how much of this prophecy has come to pass.

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RECYCLING ALUMINIUM TRAFFIC SIGNS

RRSL - Recycling and Refurbishing Sign Line

Each year Alberta Transportation and Utilities must discard or dispose of thousands of traffic signs that have been damaged or worn out from years of weathering. Sometimes signs are fabricated incorrectly, are flawed or require removal because of a change in route marking, as in the case of the "Yellowhead Highway".

But now a process for refurbishing and recycling of these aluminium signs has been made available to the department through a local sign manufacturer, Alberta Traffic Supply Ltd. The process involves cold rolling to flatten bent highway signs and then milling to remove old sheeting and inks. A research project sponsored by Operations Branch and the Sign Shop was conducted to get a first hand look at how successful the process really was. A sample of discarded signs in a wide range of conditions was subjected to the RRSL process. The test confirmed our expectations. While severely damaged signs with holes ,tears or major bends in them could not be properly restored, the bulk of the recycled signs were successfully resheeted and looked as good as new.

Strength and adhesion tests done by local labs confirmed that the recycled sign blanks would meet all government specifications. The cost saving to the department was significant. Recycled sign blanks cost roughly half that of virgin sign blanks.

Operations Branch and the Sign Shop have responded with enthusiasm to these test results, by asking all Regions to forward discarded signs for recycling from now on. Who can blame them. Recycling is great for the environment but it doesn't hurt to save a few bucks in the process!

- John Lowe

DOING SOME INTERESTING RESEARCH THAT MAY BENEFIT OTHERS IN THE DEPARTMENT ???

Write An Article About It And We'll Put It In The Next Issue Of TRANSEARCH !!!

Smart Highways

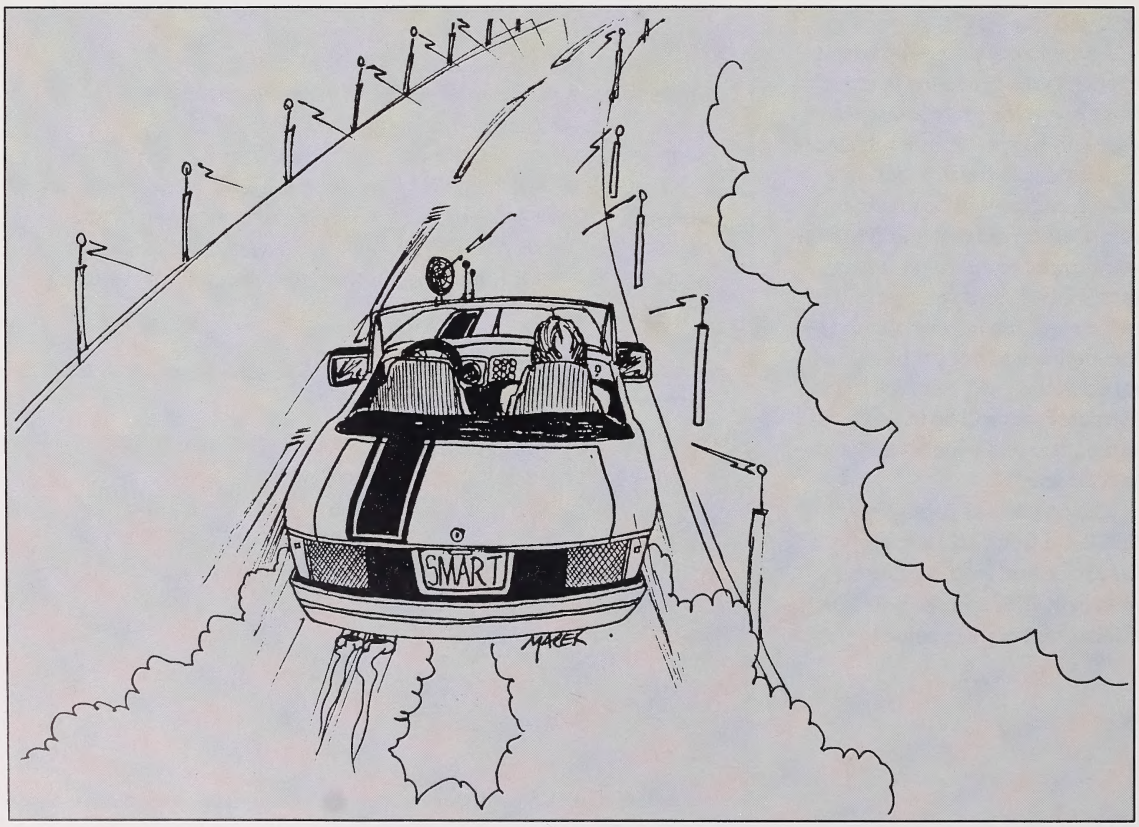
by Zach Zacharia

I answered the question as it came upon the screen.

Destination: **Calgary**
Exit: **No.48**
Stops: **No**

I felt the car smoothly accelerate from the access entrance onto the highway, the steering wheel seemingly disconnected from the wheels as highway #2 central computer control tookover. I looked out the window and saw other cars all around me closer than I could park. We were smoothly cruising at the same speed, my speedometer read 180 km/hr. I settled back and looked at my notes for a meeting in Calgary. I couldn't believe it, just 50 years ago they had manually controlled cars on this highway!

Science Fiction? Perhaps, but this type of smart highways technology might be our only alternative in the future. As urban growth continues to grow at about 5% per year in North America, by the year 2005 there will be a 50% increase in the number of cars. This will mean a typical rush hour delay of 10 to 15 minutes will stretch to an hour by the next century. In the future building more roads will not be an available option. Instead various forms of smart highways will have to be considered. Smart Highways is defined as a "road that is so smart that it can guide similarly intelligent vehicles to their destination



without help from human drivers."

There are many systems that are presently in the design stage in smart highways technology.

A system that electronically stores information at the roadside and transmits messages to in-vehicle video displays or voice synthesizers. This could provide site specific messages or indicate maintenance workers ahead, instead of relying on road signs or billboards.

Tag each vehicle with a code such that when it passes a high speed scanner it could automatically bill the toll amount or register a speeding ticket without the present expense and time cost involved.

Use automatic vehicle positioning systems to locate vehicles for large fleet central dispatchers like police, ambulance, or courier fleets. Hazardous goods vehicles would be able to be tracked as they travel through an area.

Have an automatic navigational system on board the vehicle.This can be tied to a central computer which will have up to date traffic information on all the routes. The navigational system will indicate the fastest route to a destination taking into account real time traffic congestion. The map database could be tied to sensors in the road so that the in-video display would show the location of your vehicle as it travels.

Have an intelligent cruise control which maintains the proper distance from the vehicle ahead and beside by using radar or lasers to sense the distance. The intelligent control would be able to react to sudden intrusive maneuvers. This system would automatically control the brakes to prevent collisions.

The ultimate would be a smart highway that would continuously regulate the speed and position of all the vehicles on it. The computer would arrange the vehicles for maximum throughput depending on the destination of the vehicles. The life expectancy of the highway could be increased by eliminating the repetitive loading of heavy vehicles on one lane. The computer would be able to move the lanes a meter over on a monthly or weekly basis. Since there would not be any permanent lanes there won't be any wheel ruts. Traffic lanes and traffic mix could even change daily! The computer could also place the vehicles a lot closer, increasing the capacity of the highway, because the reaction space between vehicles would be unnecessary. Weather problems and maintenance activity could all be updated on a daily basis.The velocity travelled by the vehicles could be as much as 200 km/hr making road travel very competitive with air travel for most intercity trips.

Presently a number of programs around the world are aimed at the creation of smart highways. The Pathfinder project in Los Angeles with Caltrans and General Motors working together have 25 Oldsmobiles equipped with computer screens that can display digital maps. Traffic control centers receive information on traffic congestion from highway sensors which are transmitted to the Oldsmobile when it reaches a particular location. A cursor will flash on the digital map indicating the vehicles present position and the best route to follow to avoid congestion.

Prometheus which stands for Program for European Traffic with Highest Efficiency and Unprecedented Safety involves 20 automotive manufacturers, 70 research institutes in six countries. The goal of Prometheus is to reduce the risk of collisions by 50% by the year 2000 using collision avoidance technology and to enhance communication and traffic control.

Japan has two programs, the Advanced Mobile Traffic Information and Communication System and the Road/Automobile Communication System. These systems are trying to develop a navigation system which displays the vehicle's position on an on-board video monitor which will highlight areas of congestion that the motorist could avoid.

Of course there are many obstacles other than technological ones to overcome. For example who is liable if something goes wrong on the smart highway? There will also be psychological issues with drivers having to give up control over the vehicle or even having to listen to a computer which tells them what to do. But there will come a time when we will have no choice but to consider smart highways technology, they simply are not making that much new land these days! So lean back and imagine a highway that automatically, safely and speedily brings you to your destination.

The following articles were consulted in developing this article:

Brown, Warren.
"Smart Highways"
TRANSPORTATION BUILDER
First Quarter 1989. pp. 24-25.

Ervin, Robert & Chen, Kan.
"Toward Motoring Smart"
ISSUES IN SCIENCE AND TECHNOLOGY
Winter 1988-89. pp. 92-97.

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Technology Transfer — On The Leading Edge

by Ray Filipiak

In the April, 1989 issue of TRANSEARCH (a whole year ago), I wrote my first article on Technology Transfer. It was somewhat of an airy fairy article with a humorous overtone. This time round I felt that I should role up my sleeves and get down to some serious writing. What resulted from that was the first draft of this article (the version you are reading now is the third draft). In my over zealous attempt to emphasize what I truly believe is one of this Department's more important undertakings for the new decade I wound up writing a really heavy article that would be about as exiting to read as the fine print footnotes in a law course text book written in Latin. So back to the drawing board, or better said, writing board it went.

What I decide to do is break this article up into two parts. I extracted some of the important points from my first draft and highlighted them in what a colleague advised me to call "technical digests"(???). The stuff you are reading now is new stuff. If you are interested in what has been accomplished under the umbrella of the Technology Transfer Program over the past twelve months read on. If you want the Readers Digest version of the old stuff which details the foundation blocks of the Technology Transfer Program just read the technical digests ..... and ..... if you're still curious and want even more detail then follow up by contacting me for a copy of the "Official Document".

Mind you .... nothing is preventing you from reading both the old stuff and the new stuff.

So ... lets talk about what's happened in Technology Transfer over the past year. In trying to meet the objectives set out in the Program a few things have been initiated:

1) Communication networks have been established both internally in the Department and externally (a listing of A.T & U. Technology Transfer Representatives has been provided). The idea

Technology Transfer Technical Digest

Technology Transfer has existed in some shape or form for a long time. However, not until now, with the dawning of the Information Age (the computer and electronic age) has there been such an opportunity for maximizing the benefits of technology and information exchange.

There currently exist many forms of Technology Transfer. To add to this, Technology Transfer has different meanings to different organizations. In the context of our program Technology Transfer is defined as follows:

"Technology Transfer is the effective communication, via any medium proven suitable, of technological information sparked by an identifiable need, with the ultimate goal of delivering tangible benefits to the every day operations of Alberta Transportation and Utilities. The search for technology shall not be limited to the boundaries of the highway related industry".

The objective of the Technology Transfer Program is to build on established research mechanisms and existing cooperative processes, with focus on harnessing new and existing technologies rather than expanding own research activities.

Within the scope of the Technology Transfer Program, Research and Development Branch will examine how emerging technologies in materials, construction, process, safety, automation, information and expert systems, robotics and telecommunications can advance the Department's planning, design, construction and maintenance operations and their support environment.

The underlying philosophy which governs the actions executed under the umbrella of this program are:

- an innovation must be advantageous and must produce improvement over current technology or practice;
- an innovation must be readily understood by the users (ie. not be technically cumbersome), clear (ie. relevant and concise), readily adaptable to existing techniques (ie. easy to implement or to abandon if not successful in delivering tangible benefits):
- an innovation must be easy to evaluate for practicality, efficiency, quality of results,

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here is ... if you have any neat, innovative ideas on products, processes or techniques you are using or have heard about and would either like to share with others or would like more information, contact your TT Rep and in turn they will contact me and I'll try to help you out.

2) A five year Technology Transfer Plan is being developed. The major portion of this plan will consist of technological needs identified by the TT Reps.

3) An operational document has been prepared and is available

Technology Transfer (cont'd)

costs and benefits.

- an innovation's up front costs must be minimized;
- an innovation must be introduced gradually to allow users to adjust (ie. learning curve);
- the implementation of an innovation must consider spin-off impact (ie. effects on related activities); and finally,
- the implementation of an innovation must be cognizant of, sensitive to and adapted to the users needs.

The strategic plan for the Technology Transfer Program was designed to facilitate an easy understanding of the program's implementation and development process. This involved breaking the program down into two levels and further modularizing these into mechanisms to assist logical program development.

The two mechanism levels are identified as:

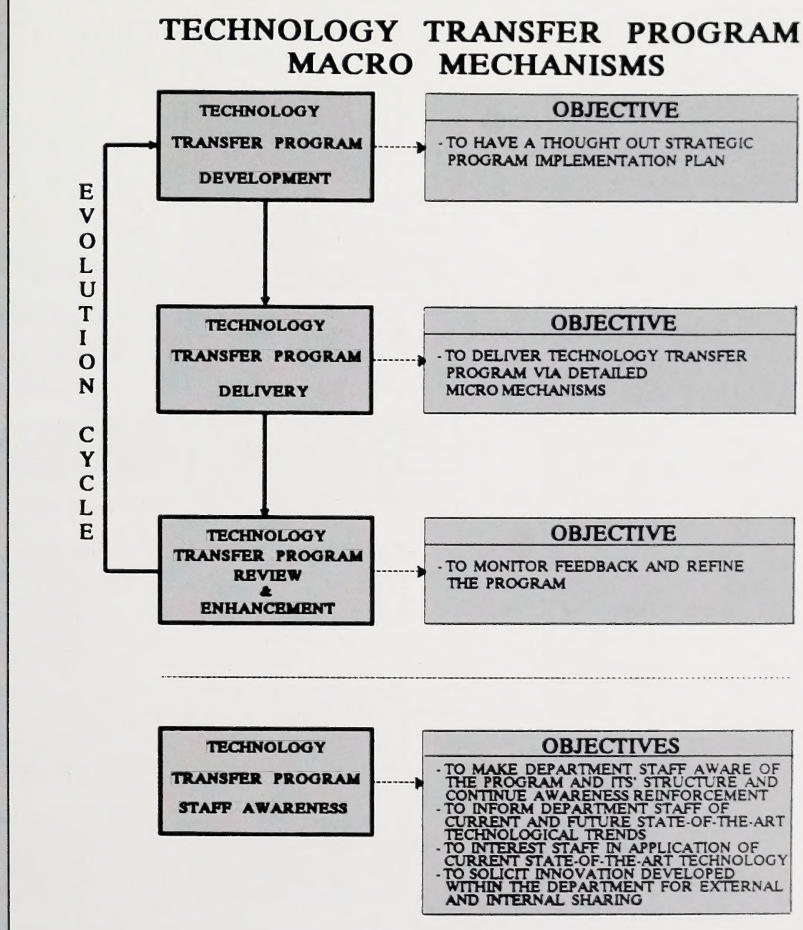
- Macromechanisms; and
- Micromechanisms.

Figure 3.1.A. depicts four macromechanisms which give us a global overview of the program.

The Micromechanisms stem from the Program Development and Delivery Macromechanisms and define the various aspects of the Technology Transfer Program development, implementation and processes in more detail as

continued on page 10 ➡

FIGURE 3.1.A:


TECHNOLOGY TRANSFER PROGRAM MACRO MECHANISMS
EVOLUTION CYCLE
TECHNOLOGY TRANSFER PROGRAM DEVELOPMENT
OBJECTIVE
- TO HAVE A THOUGHT OUT STRATEGIC PROGRAM IMPLEMENTATION PLAN
TECHNOLOGY TRANSFER PROGRAM DELIVERY
OBJECTIVE
- TO DELIVER TECHNOLOGY TRANSFER PROGRAM VIA DETAILED MICRO MECHANISMS
TECHNOLOGY TRANSFER PROGRAM REVIEW & ENHANCEMENT
OBJECTIVE
- TO MONITOR FEEDBACK AND REFINE THE PROGRAM
TECHNOLOGY TRANSFER PROGRAM STAFF AWARENESS
OBJECTIVES
- TO MAKE DEPARTMENT STAFF AWARE OF THE PROGRAM AND ITS' STRUCTURE AND CONTINUE AWARENESS REINFORCEMENT
- TO INFORM DEPARTMENT STAFF OF CURRENT AND FUTURE STATE-OF-THE-ART TECHNOLOGICAL TRENDS
- TO INTEREST STAFF IN APPLICATION OF CURRENT STATE-OF-THE-ART TECHNOLOGY
- TO SOLICIT INNOVATION DEVELOPED WITHIN THE DEPARTMENT FOR EXTERNAL AND INTERNAL SHARING

to anyone who wants to read it (it's the one I refer to in the old stuff portion of this article).

4) Promotion of this program has been initiated on many fronts (one being through this article in TRANSEARCH - oh! that's another one.....).....

5) TRANSEARCH has been off and running for more than a year now. This is one of Technology Transfer's information exchange mediums, however, it seems that most of the information has been coming from R&D lately. Let it be said again

Technical Digest (cont'd)

depicted in Figure 3.1.B.

The details of this plan are elaborated on in the supporting document entitled "TECHNOLOGY TRANSFER - GENERAL DISTRIBUTION DOCUMENT" (copies may be obtained by contacting the author at Research and development Branch, Alberta Transportation and Utilities).

The major aspects of the Technology Transfer Program can be summarized as follows:

- The emphasis of this program is on capturing and adapting new and existing technologies, techniques and processes;
- The success of this program is strongly dependent on effective communication;
- The underlying objective of this program as a whole is to avoid duplication of efforts (whether it be within the Department or within the industry as a whole) and to maximize efficiency of the operations performed by this Department;
- The underlying function of this program is to look at Departmental technological needs from a different perspective and to search for potential (not always conventional) solutions to those needs.

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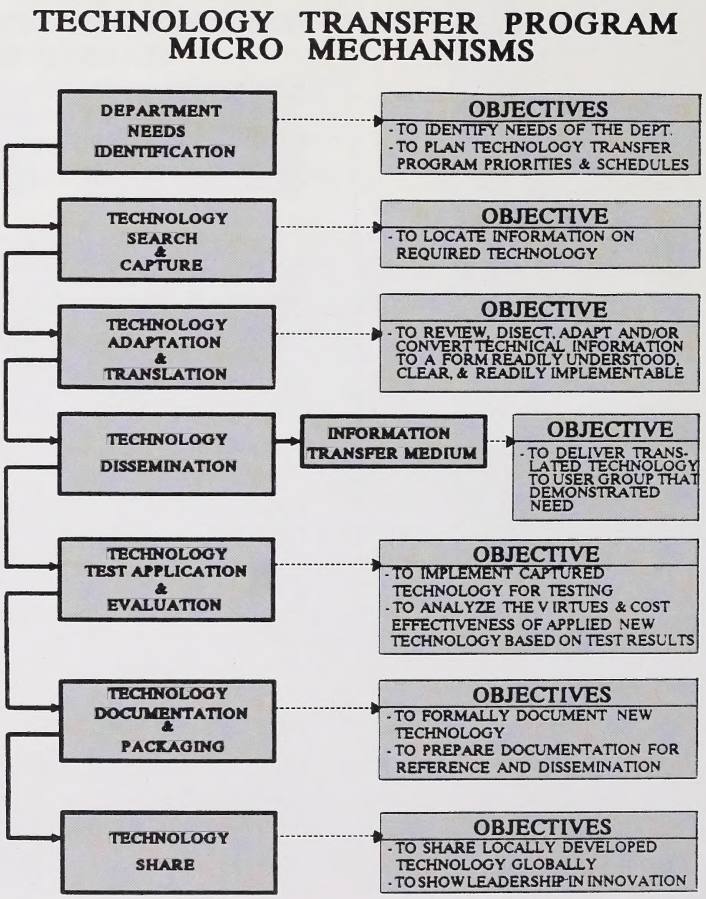
FIGURE 3.1.B:


TECHNOLOGY TRANSFER PROGRAM
MICRO MECHANISMS
DEPARTMENT NEEDS IDENTIFICATION
OBJECTIVES
- TO IDENTIFY NEEDS OF THE DEPT.
- TO PLAN TECHNOLOGY TRANSFER PROGRAM PRIORITIES & SCHEDULES
TECHNOLOGY SEARCH & CAPTURE
OBJECTIVE
- TO LOCATE INFORMATION ON REQUIRED TECHNOLOGY
TECHNOLOGY ADAPTATION & TRANSLATION
OBJECTIVE
- TO REVIEW, DISECT, ADAPT AND/OR CONVERT TECHNICAL INFORMATION TO A FORM READILY UNDERSTOOD, CLEAR, & READILY IMPLEMENTABLE
TECHNOLOGY DISSEMINATION
INFORMATION TRANSFER MEDIUM
OBJECTIVE
- TO DELIVER TRANSLATED TECHNOLOGY TO USER GROUP THAT DEMONSTRATED NEED
TECHNOLOGY TEST APPLICATION & EVALUATION
OBJECTIVE
- TO IMPLEMENT CAPTURED TECHNOLOGY FOR TESTING
- TO ANALYZE THE VIRTUES & COST EFFECTIVENESS OF APPLIED NEW TECHNOLOGY BASED ON TEST RESULTS
TECHNOLOGY DOCUMENTATION & PACKAGING
OBJECTIVES
- TO FORMALLY DOCUMENT NEW TECHNOLOGY
- TO PREPARE DOCUMENTATION FOR REFERENCE AND DISSEMINATION
TECHNOLOGY SHARE
OBJECTIVES
- TO SHARE LOCALLY DEVELOPED TECHNOLOGY GLOBALLY
- TO SHOW LEADERSHIP IN INNOVATION

now in witness of all those who read this... "TRANSEARCH is open to anyone who has something to write about, that is, anything road/highway related with a hint of technology in it".

6) Work on a A.T. & U. Library Referral system has been initialized. Readers of library literature who have found some item of interest and would like to obtain more information on the subject will be able to perform a follow up with the assistance of

Technology Transfer Representatives

TT Rep Name	Title/Position Description	AT&U Location (Branch/District)	TT Rep Phone#	Rite #
Ian Baird	Contract Admin. Eng.	Contracts Engineering	427-2094	7-2094
Mike Olinyk	Utilities Eng	Design Engineering	427-3177	7-3177
Chuck Mcmillan	Special Proj.Eng.	Mat. Eng. - AT&U Lab	427-8053	7-8053
Jane Stoeck*	Surfacing Design Eng	Materials Engineering	427-3101	7-3101
Ron Forster	Traffic Operations	Operations Branch	422-2147	7-7377
Harry Parenteau	Equipment Eng.	Equip. Sup. & Services	427-8310	7-8775
C. Michel-Viret	Research Officer	Motor Trans. Services	427-5184	7-5184
Gerry Flynn	Mgr. Photo Engineering	Roadway Planning	427-7065	7-7065
Anita Jensen*	Asst.Dir.Prop.Serv.	Property Services	427-3132	7-3132
Jack Stonehouse	Project Services	District 1	529-3640	184-3640
Tim Hawnt	Resident Engineer	District 2	381-5480	181-5480
Ivan Perich	Asst. District Eng.	District 3	854-5550	165-5550
Fred Lee	Resident Trans. Eng.	District 4	297-7677	161-6311
Khalid Choudhary	Resident Eng.	District 5	742-7577	153-7577
Ed Spetter	Project Manager	District 6	340-7711	151-5576
John Matwychuk	Res. Inspection Eng.	District 7	963-5711	—
Roger Oberg	District Trans. Eng.	District 8	723-8250	130-1165
Peter Fedoretz	Proj. Services Tech.	District 9	675-2624	—
Gerry Pyper	Asst.Dis.Trans.Eng.	District 10	853-8178	141-1178
Terry Colosimo	Resident Engineer	District 11	623-5256	137-1250
Gordon Mcindoe	Asst.Dis.Trans.Eng.	District 12	523-6620	122-6620
Mohammad Raheem	Asst.Dis.Trans.Eng.	District 13	538-5310	121-5310
Cindy Macgowan	Asst.Dis.Trans.Eng.	District 14	624-6130	120-6130
Herb Mahood	Asst.Dis.Trans.Eng.	District 15	926-2241	—
Jim Lovatt	Asst. Director	Strategic Planning	427-7944	7-7944
Cy Yeung	Supervising Eng.	Strategic Planning	427-7944	7-7944

Contact Person

Technology Transfer. Items could include any existing technology, process or innovation that may be incorporated or adapted to a Departmental operation.

7) Some of you may have been privy to the "Technology Transfer Information Bulletin". This is another vehicle whereby, if the Technology Transfer section comes across any information on a innovative technology that may be applied to a given area of the Department, a bulletin with a short abstract on the technology is sent to that targeted area. Further inquiry into the item is subject to the response by the target area.

8) We're also working on the idea of rewarding innovation spawned within the Department. This is being done in conjunction with the Rewards and Recognition Committee. The idea behind this is to inspire innovation and incite staff to share their innovations. The types of goodies constituting the award have not been established as yet. I'm working on it though.

9) What else? - Oh yes, how could I forget. This spring, April 23 - 26, 1990 to be more specific, A.T. & U. will be hosting the 1990 WACHO Conference. There are few new things happening at this conference. Firstly, there is a theme this year, "People, Environment and Technology". Secondly, a new group has been established at this conference through the efforts of the Technology Transfer Section. The group is called, what else, "Technology Transfer Technical Group". I urge everyone to check it out - it's going to be a good one. Thirdly, ...I forgot.....

10) In the first year of Technology Transfer we looked into a few "Strategic Technologies". These are technologies that exist in other industries, but have not been fully adapted to the road/highway industry as yet. These technologies are only being looked at if there is a high potential payback on investment. The first of these technologies to have a product fallout are Expert Systems. We developed two of them. Each has a potential of incredible payback within the first year of implementation. For example, the Bridge Paint Expert System (B.P.E.S.) cost us around $15,000 to develop. Get this, the potential payback is estimated between $500,000 to $1,000,000 per annum. We're looking into other Strategic Technologies all the time and I'm sure you'll be reading about them in the near future. We have to brag about them, right?

Well that's about all the new stuff I think I'll write about this time. But, just before I sign off....

In previous issues of TRANSEARCH the other sections of Research and Development Branch were highlighted. This time it was Technology Transfer's turn. To pull it all together I want to conclude by stating that three sections comprise R&D and each has a specific function (although many processes that are employed are common among the sections).

There is the Materials and Operations Section that performs applied research on, as the name implies, materials and operation aspects of this Department's functions. This section may also be addressing environmental issues on a more frequent basis in the future.

The Roadway Engineering and Equipment performs applied research on, again as the name implies, various equipment used by this department as well as engineering processes and safety issues. The processes employed by both sections have intrinsic technology transfer components.

Technology Transfer Section, the baby of the bunch, does not perform applied research per se. The main function of this section is to expand on the communication channels already created by the other two sections, and to assist, not only the other two sections in the branch, but all areas within A.T. & U., in maintaining effective information exchange. Technology Transfer is also expanding communication channels, or networks if you will, outside of the department on a continuous basis in an effort to create a broader interface to the industry. This interface will allow the possibility for greater exploitation of available and new technologies.

To sum it up ... these three sections all work together in the ultimate objective of maximizing the potential returns on technology sharing within our industry. We're working for you - so keep in touch, will ya!

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The Alberta Special Products Evaluation Listing

by Marcel Chichak

Imagine a situation where you need a product for a special application. It is something you don't normally keep on hand, and use it so infrequently that a specification was never developed for it. Just the same you would like to know if it is the best product for a given application. Fundamentally you know that someone, somewhere has probably tested it, but you just can't remember who, and you don't have the time to get on the phone and track it down, even if you know where to start.

Or in another situation imagine that a salesman marketing their "miracle product" is in your office again. He tells you that District 21 used their product successfully and it sells well down in the Hat area also. No, he doesn't quite remember the contact persons name, but he's sure they'd tell you it is good stuff. The prospect of finding the elusive information makes you tired so you tell him you'll think about it.

Wouldn't it be nice if you could just consult a central database and find out whether a particular product has been tested and approved for use before, and who can supply you with further information? This is not an uncommon thought. AT&U is among the largest and most geographically decentralized departments with the largest jurisdiction of any in the province, and it is very difficult to disseminate information over such a large area. What's more, people forget details. By recording the outcome of field trials and laboratory test results in a central database, redundant testing and frustrating searches can be eliminated.

The Research and Development branch, in conjuction with the A.T.& U. library, have recognized this problem and undertaken the task of establishing the Alberta Special Product Evaluation Listing (ASPEL), an electronic database of all special products of interest by the Transportation Department of Alberta. Just what is the definition of a Special Product? For the purpose of ASPEL it is: any product which is not regularly used, no specification exists for it, it is new to the market, or has very specialized application. ASPEL will initially be accessible through dial-up service to a reference librarian at the main library, while we are considering the possibility of issuing a hard copy or electronic copy to user branches or districts at a later date.

Ultimately, dial-up contact to the database will give you the following information under generalized product categories:

- Manufacturer, product name and generic category,
- where it can be obtained,
- what testing has been done,
- who tested it,
- who to contact for more information,
- what reports or other references are available,
- whether the product is accepted for a specific use or not.

The database can be searched by generalized product category, or by any of the categories listed above.

Centralized access to this type of information has been identified as being essential for some time. But just give some thought to the scale of the job: all Branches, Regions and Districts buy special products. They all have their own favorite products. They all have tested products and forgotten about the results. We will have to retrieve all that information and enter it on one database. The success of the project is dependant on each and everyone of you who tested special products before. With your help we can build a valuable and comprehensive database which will benefit the whole department.

Presently we are initiating the database with reports and product information available from within the R&D branch. By the time this article is published we have already created over 200 product records and are generating more every day. We are in the process of issuing a preliminary hard copy of the ASPEL to each Branch, District and Region along with data sheets for recording pertinent information from each area. Again, the success of the project depends on your participation.

If you would like to know more about the project, please contact either the author, or Helen Tetteh-Wayoe at 422-2750.

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The Search Continues

by Brian Hunter

Replacement of old corroded steel pipe culverts under existing highways is a difficult and costly undertaking. It often requires the closure of the highway to facilitate removal of the old culvert through open cut excavation while replacing it with a new one.

As part of a wider scope culvert study, the Design Engineering Branch of Alberta Transportation and Utilities designed several culvert installation experiments in order to evaluate alternative culvert materials and replacement or rehabilitation technologies. Two separate concepts emerged during the design of these experiments.

The first concept aimed at replacing the existing culvert with a more durable culvert material and installing the new culvert without excavation. Reinforced concrete pipe was chosen as the replacement material and an installation technique called "jacking" was utilized for placement. Jacking involves boring through the embankment adjacent to the existing culvert and pushing the culvert pipe through the new cavity. After the new culvert is in place, the old damaged one is sealed off permanently. The second concept is aimed at rehabilitating damaged existing steel culverts by lining them with plastic pipes. The cavity between the new and old culvert is filled with a special grout to prevent seepage and wash out.

Both of these concepts were demonstrated on actual projects on highways 63 and 37 during the 1989 construction season. The existing corrugated steel pipe culverts (CSP) under these two highways experienced shorter than expected service life due to corrosive soil conditions and required urgent replacement or rehabilitation.

Over thirty reinforced concrete pipe (RCP) culverts were installed on Hwy.63 during the summer of 1989 in an effort to replace the existing badly corroded corrugated steel pipe culverts. The jacking installation technique was used, to eliminate the need for open excavation, which could not be accommodated on this highway. The cost of this replacement technique was found to be rather expensive, however, it was the best possible solution considering that Hwy. 63 is the only access to the north-eastern part of the province, which makes traffic divertion impossible. Closure of the road would have resulted in a major interruption to traffic serving the population and resource industry in the area and could not be considered viable.

Five other culverts were rehabilitated on the same highway

and one on Highway 37, using plastic pipes as liners inside the badly corroded existing steel culverts. The plastic pipes used in these installations were obtained from three different pipe manufacturers in Alberta and each installation was "custom designed" to obtain the best fit. The following chart illustrates the various combinations selected for installation.

Existing ∅ CSP mm	Liner Supplier	Liner Diameter (mm)(inside)
900	Canron	675
600	Sceptor	450
600	Canron	450
800	*Big "O"	600
900	**Big "O"	600

*Big "O" Boss (Corrugated in, smooth out)
**Big "O" Boss N-12 (Corrugated out, smooth in)

From this chart it is evident, that when liners are used, the diameter and flow capacity of the existing culvert is reduced considerably. This capacity reduction should be checked against expected flow for adequacy. The reduced diameters may also make maintenance like cleaning difficult and has to be considered also. Apart from the reduced diameters, this rehabilitation technique was found to be very economical and simple and should be considered where the reduced diameters will not affect culvert maintenance and performance.

The above experiments were aimed at exploring innovative culvert rehabilitation and replacement technologies and providing valuable information toward a much larger "Culvert Study" which is going to be published by the Design Engineering Branch in the near future.

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TRANSEARCH would like to relay a special thanks to its freelance artists:

Jeff Keller - cover page art
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THANK YOU!!!

Compliments to District #7

For a number of years, Research and Development has been involved in various research activities relating to the use of both temporary and permanent pavement markers.

District #7, and other districts too, have often supported our research with field evaluations of various products within their jurisdiction. Of particular note, some permanent pavement markers were installed for test on Highway #2 in the vicinity of the 50th Street overpass at Leduc, back around 1983. At the time positive feedback was received about the effectiveness of these devices in roadway night-time delineation, particularly in wet weather conditions. Well, over time, as with most things, their effectiveness was reduced as they wore out. Recently, however, following resurfacing of the highway in this area, new markers were installed. Again comments have been coming in to Research and Development about how good these markers look.

I would just like to pass along my compliments to District #7 for their continued use of these markers for supplementary delineation and would like to encourage all districts to give them another look, if you'll excuse the pun!

- John Lowe

Recent Publications:

Report No.: ABTR/RD/TM-89/04 (author - J. Lowe)
Title: "Recycling and Refurbishing Sign Line"
Brief: Describes the effectiveness of a recycling process for refurbishing traffic signs.

Report No.: ABTR/RD/RR-89/03 (authors: Marcel Chichak and Ray Filipiak)
Title: Evaluation of Calcium Magnesium Acetate (CMA) for Bridge Deck De-icing in Alberta
Brief: This report documents the results of a field evaluation program which assessed the deicing performance of CMA during the winters of 1987-89 in Northern Alberta.

Report No.: ABTR/RD/RR-89/05 (authors: Marcel Chichak, Ray Filipiak, Helen Tetteh-Wayoe)
Title: National Survey of ACP Cracksealing Practices
Brief: This report presents the results of the 1988 survey of cracksealer materials and practices used by the various transportation departments across Canada.

Report No.: ABTR/RD/RR-89/08 (author: Alan Mah)
Title: Wildlife Warning Reflectors
Brief: The report summarizes the results of a three year evaluation program into the effectiveness of Swareflex and Bosch wildlife warning reflectors in Alberta.

Report No.: ABTR/RD/TB-89/01 (author: Marcel Chichak)
Title: The Use of Silicone in Hot Mix Asphalt Concrete
Brief: A brief summary of the limited scope literature search into the effects of silicone when used as an additive in ACP mix.

Report No.: ABTR/RD/TB-89/02 (author: Zach Zacharia))
Title: Reflectorless Laser Survey System Evaluation
Brief: This report evaluates the advantages and disadvantages of a reflectorless laser survey system compared to conventional survey techniques.

Reference Publications:

ABTR/RD/TM-84/08
(author - J. Lowe)
Title: "Evaluation of Snowplowable Raised Pavement Markers: Model Stimsonite 96"
Brief: Describes an evaluation of Stimsonite 96 snowplowable pavement markers installed at various locations within District #7.

ABTR/RD/TB-86/05
(author - D. George)
Title: Evaluation of Stimsonite 96 Pavement Markers for Safety Related Delineation"
Brief: Describes a review of the before and after safety record of various collision prone sites that were provided with snowplowable pavement markers for supplementary delineation.

Most Requested Publications:

Report No.: ABTR/RD/RR-86/09 (authors: Paul Carter and Alan Forbes)
Title: Comparative Evaluation of the Waterproofing and Durability Performance of Concrete Sealers
Brief: This report covers the absorption and vapour transmission test results of 58 commercially available concrete sealers and the chloride penetration results of 28 sealers subjected to 200 freeze-thaw cycles and ultraviolet light rays.

Report No.: ABTR/RD/RR-87/05 (authors Suresh Gurjar and Paul Carter)
Title: Alberta Concrete Patch Evaluation Program
Brief: This report presents the findings of a laboratory test program aimed at evaluating the performance of 46 commercially available concrete patching materials under simulated field exposure conditions.

Report No.: ABTR/RD/RR-88/04 (author: Colin Johnston)
Title: Silica Fume Concrete
Brief: This report covers a two phase test program aimed at establishing the best concrete mix capable of producing superior quality concrete using silica fume as an additive.